

Material Safety Data Sheet

Complete Oil Breakdown Rate Analyzer (COBRA) Standard

Revision: 1

Revision date: October 28, 2003

1. Product identification and manufacturer information

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| Name | Complete oil breakdown rate analyzer (COBRA) standard |
| General composition | Tricresyl phosphate (33% w/w) in lubricating oil |
| National stock no. (NSN) | 9150-01-461-8114 |
| Manufacturer | Joint Oil Analysis Program Technical Support Center |
| Manufacturer's address | 85 Millington Avenue Pensacola, FL 32508-5010 |
| Manufacturer's telephone no. | 850-452-5627 |
| Manufacturer's telefacsimile (fax) no. | 850-452-2348 |
| Transportation emergency Call CHEMTREC (24 hours a day) | 800-424-9300 or 703-527-3887 |

2. Composition and information on ingredients

| Component | Percentage |
|---|------------|
| Base oil, MIL-PRF-7808 | 67 |
| Tricresyl phosphate CAS RN [68952-35-2] Empirical formula: $C_{21}H_{21}O_4P$ Molecular formula: $(CH_3C_6H_4O)_3PO$ mixed structural isomers, less than 1% <i>ortho</i> -isomer <i>Synonyms:</i> Cresyl phosphate; tritolylphosphate; Tris(tolyloxy)-phosphine oxide; phosphate de tricresyle (French); tricresilfosfati (Italian); tricresylfosfaten (Dutch); trikresylfosfat (Czech); tritolyl-fosfat (Czech); Trikresylphosphate (German); | 33 |

3. Hazards identification

EMERGENCY OVERVIEW

COMBUSTIBLE LIQUID AND VAPOR; HARMFUL OR FATAL IF SWALLOWED
CAUSES SKIN IRRITATION; READILY ABSORBED THROUGH THE SKIN
HARMFUL IN CONTACT WITH SKIN AND EYES
AVOID THIS MATERIAL IF PREGNANT

OSHA PEL and ACGIH TLV for oil mists are 5 mg/m^3 .

Possible physiologic targets include male reproductive tissues, nerve tissue, fetal tissue.

Persons (men and women) attempting to conceive should avoid exposure. Pregnant women should avoid exposure.

See section 11 for additional toxicity information.

| COBRA STANDARD | |
|--|---|
| HEALTH | 1 |
| FLAMMABILITY | 1 |
| PHYSICAL HAZARD | 0 |
| PERSONAL PROTECTION EYEWEAR, GLOVES, FUME HOOD, APRON, LABCOAT | |

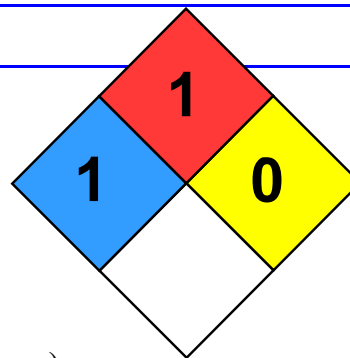
4. First aid measures

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| Eyes | Flush with water for 15 minutes; contact a physician or poison control center. |
| Skin | Wash with soapy water or waterless hand cleaner |
| Inhalation | Remove to fresh air. If not breathing, perform artificial respiration. |
| Oral | Rinse mouth with water. |
| Ingestion | Do not induce vomiting; contact a physician or poison control center. |

In all cases, if irritation or adverse symptoms develop, **SEEK MEDICAL ASSISTANCE**.

5. Firefighting measures

| | |
|---------------------------------|--|
| NFPA health rating | 1 |
| NFPA flammability rating | 1 |
| NFPA reactivity rating | 0 |
| Flash point | > 410 °F (210 °C) (closed cup) |
| Extinguishing media | Water spray/fog, dry chemical, appropriate foam, or carbon dioxide |
| Protective equipment | Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. |
| Specific hazards | Carbon monoxide, carbon dioxide, various hydrocarbons and their oxides, and various phosphines and their oxides may form when burned. Smoke containing strongly acidic phosphorus oxides may form when burned. |



6. Accidental release measures (special precautions, spill and leak procedures)

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| Procedure to be followed in case of leak or spill | Evacuate area. |
| Personal precaution | Wear (NIOSH/MSHA-approved) self-contained breathing apparatus, rubber boots, and heavy rubber (neoprene) gloves. |
| Methods for cleaning up | Cover with dry lime or soda ash, pick up, keep in a closed container, and hold for waste disposal. Ventilate area and wash spill site after material pickup is complete. |

7. Handling and storage

Store in closed containers. Keep container closed when material is not in use.

Store in well-ventilated area. This chemical is suitable for general storage and can be colocated with other chemicals classified for general storage that require fume exhaust.

Do not store near oxygen, strong oxidizing agents, strong reducing agents, strong acids, or strong bases.

Avoid work practices that may release volatile components into the atmosphere. Local air pollution regulations should be consulted to determine if the release of volatile components is regulated or restricted in the area in which this material is used.

There is a small risk that electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating an accumulation of electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. For more information, refer to OSHA Standard 29 CFR 1910.106, *Flammable and Combustible Liquids*; National Fire Protection Association (NFPA) 77, *Recommended Practice on Static Electricity*; and/or the American Petroleum Institute (API) Recommended Practice 2003, *Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents*.

Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force.

Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly cleaned (pursuant to RCRA), and disposed of in accordance with applicable laws and regulations.

Avoid contaminating soil or releasing this material into sewage and drainage systems and bodies of water. Do not allow material to enter surface waters or sanitary sewer system. This material is classified as an oil under Section 311 of the Clean Water Act. In the U.S., spills that generate a sheen must be reported to the Department of Transportation's National Response Center (1-800-424-8802).

Do not get in eyes, on skin, or on clothing. Do not taste or swallow. Avoid breathing vapor or fumes. Wash thoroughly after handling.

8. Exposure controls and personal protective equipment (PPE)

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| Ventilation | Use with adequate ventilation to control exposure to below recommended levels. Use only in a chemical fume hood or wear an approved respirator. |
| Respiratory | Avoid breathing vapors, mist, fumes or dust |
| Eye protection | Safety glasses with side shields; splash goggles; or face shield |
| Skin | Chemically resistant gloves (e.g., neoprene) and protective garments to prevent skin contact |
| Engineering controls | Safety shower and eye wash |
| General hygiene measures | Wash thoroughly after handling. Wash contaminated clothing before reuse. Avoid contact with eyes, skin or clothing. |

Gangrene may result if material is pressure-injected under the skin.

Expert assistance, such as an industrial hygienist, should be sought if unusual or special conditions exist.

OSHA PEL and ACGIH TLV for oil mists are 5 mg/m³.

9. Chemical and physical properties

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| Appearance | clear oily liquid |
| Odor | mild |
| Normal boiling point | > 350 °F (177 °C) |
| Vapor pressure at 68 °F (20 °C) | < 1 mm Hg |
| Vapor density (air = 1) | > 10 |
| Solubility in water | negligible |
| Other solubility | soluble in hydrocarbon solvents |
| Percent volatile by volume | negligible |
| Specific gravity (water = 1) | 0.85–1.1 @ 60 °F (16 °C) |
| Evaporation rate | negligible |

10. Stability and reactivity

| | |
|---|---|
| Stable | under normal conditions |
| Conditions to avoid | high heat |
| Materials to avoid | strong acids, strong alkalis, strong oxidants, strong reductants |
| Hazardous polymerization | will not occur |
| Hazardous decomposition products | Carbon monoxide, various hydrocarbons and their oxides, and various phosphines and their oxides may form under elevated temperature (especially fire) conditions. Vapor and smoke containing acidic phosphorus oxides may be released. |

11. Toxicological information

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| Eye effects | The mean 24-hour Draize eye irritation score in rabbits is 2.7/110. |
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| Skin effects | For a 4-hour exposure, the primary irritation index (PII) in rabbits is 7.0/8. The acute dermal LD ₅₀ in rabbits is > 5 g/kg. |
| Acute oral effects | LD ₅₀ > 5 g/kg in rats, LD ₅₀ > 1 g/kg in mice |
| Acute inhalation effects | not determined |

Additional toxicology information

This product contains petroleum base oils which may be refined by various processes including severe solvent extraction, severe hydrocracking, or severe hydrotreating. None of the oils requires a cancer warning under the OSHA Hazard Communication Standard (29 CFR 1910.1200). These oils have not been listed in the National Toxicology Program (NTP) Annual Report nor have they been classified by the International Agency for Research on Cancer (IARC) as carcinogenic to humans (Group 1), probably carcinogenic to humans (Group 2A), or possibly carcinogenic to humans (Group 2B).

This product contains a mixture of petroleum hydrocarbons called middle distillates (which means they boil between approximately 350 and 700 °F). Because of this broad description, many products are considered middle distillates yet they are produced by a variety of different petroleum refining processes. Petroleum middle distillates are not listed as carcinogenic by the IARC, EPA, NTP, or OSHA. Dermal treatment with some middle distillates resulted in the formation of skin tumors when repeatedly applied to mice over most of their lifetime. Other studies indicate that pure middle distillates are not genotoxic and that chronic skin irritation is necessary for the skin tumor response to occur. In addition, prolonged and repeated exposures to oil mists pose a risk of pulmonary disease or lung inflammation.

Pressurized injection of material under the skin can lead to seriously inflamed tissue. If left untreated, the injury may become gangrenous.

Signs and symptoms of (over)exposure to tricresyl phosphate are not well-defined or well-documented in humans. Based on data for similar chemicals and/or animal models, the following signs and symptoms may be associated with (over)exposure to tricresyl phosphate: ataxia (loss of voluntary muscle coordination) and flaccid paralysis (normally without anesthesia, due to neuromuscular blockage). Different toxicity mechanisms and symptoms may be associated with varying ratios of the different structural isomers.

Pregnant women should avoid exposure to materials containing tricresyl phosphate as this compound has been linked to increased rate of congenital deformities and fetal death in rodent exposure studies. Male reproductive toxicity endpoints have also been observed in rodent exposure studies, including adverse impacts on sperm formation (including genetic impacts), sperm quality, testes, epididymis, vas deferens, and other reproductive tissues/organs. This compound is suspected to have teratogenic and mutagenic properties in humans chronically exposed to it.

When given to hens in oral doses as low as 75 mg/kg, tricresyl phosphate caused delayed nerve damage characterized by loss of coordination and difficulty in walking. Continuous dermal exposure to 50 mg/kg of this material for 5 days/week for 4 weeks caused similar nerve damage in hens. Evaluations of the manufacturer's workers who make tricresyl phosphate and similar chemicals have not demonstrated any unusual pattern of mortality or disease. It is believed that there is little to no risk of nerve damage to workers who handle this product when the precautions outlined in this MSDS are strictly followed.

12. Ecological information

This material is classified as an oil under Section 311 of the Clean Water Act. Spills that generate a sheen must be reported to the Department of Transportation's National Response Center (1-800-424-8802). This material contains a substantial fraction of a DOT marine pollutant. The ecological impact of this material has not been fully assessed. Some studies of fathead minnow, bluegill sunfish, and water fleas (*Daphnia magna*) showed effects at aqueous concentrations below 1 mg/L.

13. Disposal considerations

Do not allow material to enter surface waters, ground waters, or sanitary sewer systems. This material is classified as an oil under Section 311 of the Clean Water Act. Dispose of this material in accordance with all applicable laws and regulations, such as by diluting with a sufficiently combustible solvent and then incinerating with an afterburner and acid scrubber if and where allowed.

14. Transport information

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| Proper shipping name (USDOT, IATA, IMDG) | Environmentally hazardous substance, liquid, N.O.S. (Contains oil solution of tricresyl phosphate with <1% <i>ortho</i> -isomer) |
| IATA UN/NA | 3082 |
| Hazard class | 9, no division |
| Packing group | III |
| US DOT required subsidiary labels on outer shipping container (4" edge length) | Class 9 diamond (black and white striped) Packing group 3 (PG III) UN 3082 Marine pollutant triangle |

The description shown refers to 100 mL net package size. Consult 49 CFR, or appropriate hazardous materials regulations or dangerous goods regulations, for additional description requirements and mode-specific or quantity-specific shipping requirements. For net package

sizes ≤ 30 mL, shipments are exempted from US DOT labeling requirements pursuant to 49 CFR 173.4.

15. Regulatory information

SARA 311 CATEGORIES:

1. Immediate (Acute) Health Effects: YES
2. Delayed (Chronic) Health Effects: YES
3. Fire Hazard: YES
4. Sudden Release of Pressure Hazard: NO
5. Reactivity Hazard: NO

Regulatory lists searched

| | | | | | |
|----|----------------------|----|----------------------|----|-------------------|
| 01 | SARA 313 | 11 | NJ RTK | 21 | RCRA Sect 261.33 |
| 02 | MASS RTK | 12 | CERCLA 302.4 | 22 | TSCA Sect 5(a)(2) |
| 03 | NTP Carcinogen | 13 | MN RTK | 23 | TSCA Sect 6 |
| 04 | CA Prop 65-Carcin | 14 | ACGIH TWA | 24 | TSCA Sect 12(b) |
| 05 | CA Prop 65-Repro Tox | 15 | ACGIH STEL | 25 | TSCA Sect 8(a) |
| 06 | IARC Group 1 | 16 | ACGIH Calc TLV | 26 | TSCA Sect 8(d) |
| 07 | IARC Group 2A | 17 | OSHA PEL | 27 | TSCA Sect 4(a) |
| 08 | IARC Group 2B | 18 | DOT Marine Pollutant | 28 | Canadian WHMIS |
| 09 | SARA 302/304 | 19 | CERCLA 103 | 29 | OSHA CEILING |
| 10 | PA RTK | 20 | EPA Carcinogen | 30 | Chevron STEL |

The following components of this material are found on the regulatory lists indicated: tricresyl phosphate is found on lists 18 and 28; lubricating oil (or an analogous/representative product) is found on lists 14, 15, and 17.

US classification and label text

| | |
|-----------------------------|--|
| Indication of danger | Harmful |
| Risk statements | Harmful in contact with skin and if swallowed |
| Safety statements | In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing. Do not breathe vapor. |
| US statements | Readily absorbed through skin |

Canadian Workplace Hazardous Material Information System (WHMIS) classification

Class B, Division 3: Combustible Liquids

Class D, Division 2, Subdivision B: Toxic Material–Skin or Eye Irritation

EU Directives classification

Symbol of danger: Xn N

Indication of danger: Harmful. Dangerous for the environment.

EU risk and safety label phrases

Risk statements 38, 21, 22, 51, 53

Irritating to skin. Harmful in contact with skin and if swallowed. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety statements 36, 37, 28, 61

Wear suitable protective clothing and gloves. After contact with skin, wash immediately with plenty of soap suds. Avoid release to the environment. Refer to special instructions/safety data sheets.

16. Other information

Disclaimer Material is sold as a chemical analytical test standard for standardization of instruments. This product is not for drug, household, or any other use.

Warranty All information provided herein is believed to be correct and current. This material safety data sheet is not intended to be all-inclusive; it is to be used as a guide. Individual users are responsible for safe handling and use. This material safety data sheet was prepared to be applicable for workplace use in compliance with the OSHA Hazard Communication Standard 29 CFR 1910.1200 and to be consistent with ANSI Z400.1, but its use does not guarantee compliance with applicable occupational hazard or right-to-know requirements in all jurisdictions. Many U.S. states impose additional obligations on employers.

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